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To: Mr. W. Clark
Area Manager
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ELECTROMAGNETIC INTERFERENCE (EMI) INVESTIGATION - COBOURG AREA

D.R. Goldthorpe

An EMI survey was completed on a suspected high noise level 44-kV line in the Cobourg Area. The line was found to be excessively noisy. The information collected and presented in this report will help determine the extent of line maintenance work necessary for corrective measures.

INTRODUCTION

The System Studies Section, Communications Group received a request from Line Foreman Dave Owens of the Cobourg Area Office, who wanted us to perform an EMI survey and evaluate a suspected problem on a 44-kV line along County Road #9. This particular line, has produced several customer complaints of TV interference and in particular from Mrs. Benson, the customer on the north west corner of old Hwy #28 and County Road #9. This report summarizes the results of the investigations carried out from September 8 to September 10, 1986.

INSTRUMENTATION

The following instrumentation was used for the investigation.

EMI Mobile Test Facility (truck mounted equipment for calibrated noise measurements)

1. Ailtech NM37/57A EMI-Field Intensity Meter for calibrated noise measurements.
2. Oscilloscope connected to linear video output of NM37/57A for observation of noise pulses.
3. HP X-Y Recorder for recording noise spectra (30-200 MHz).
4. Philips chart recorder for monitoring the noise levels at the Y output of NM37/57A.
5. Biconical antenna (30-200 MHz) and extendible truck mounted mast (up to 10 m).
6. Sony TV for visual inspection of interference sources.

Portable (hand held instruments) For Locating EMI Sources

1. HP model 4914 Ultrasonic Detector and parabolic reflector.

2. Micro Tech Model 1000 Power Line RFI Gun. (470-890 MHz).

3. Little Snoop (Broad Band Detector).

SUMMARY OF TESTS

On September 8 Mrs. Benson's TV picture was assessed and found to have a definite interference problem. The interference was primarily on the lower frequency channels (2-6) and resembled several gap-type sources (loose hardware). However, from the conversation with the complainant she had suggested that the interference was present during wet and dry weather. When revisited during rain 2 days later her TV was clear of any interference.

A longitudinal line survey was completed along County Road #9 on the 44-kV line 50M5 from Campbellcroft DS to Bomanton DS, an 18.5 km stretch. A strip chart recorder hooked to the Y output of the NM37/57A recorded the amplitude of the noise along the line, using a biconical antenna mounted on top of our truck for pick-up. Spot check measurements were taken at the maximum noise locations. We could identify several gap-type sources from our oscilloscope pictures (see attached photos) and portable interference detection instruments. These gap-type interference sources usually originate from loose hardware such as crossarm braces. Some insulator noise was also evident but at a much lower amplitude level. The average noise level* ranged from 60 to 75 dB with peaks as high as 78 dB. These levels are extremely high. However, along the section of line where the line maintenance work had been completed earlier, where post insulators had been installed and hardware tightened, the noise level was about 10 to 20 dB lower than the rest of the line. The oscilloscope also showed no major gap sources on this section.

RECOMMENDATIONS AND CONCLUSIONS

The 44-kV line - 50M5 from Campbellcroft DS to Bomanton DS along County Road #9 is definitely in need of some maintenance work because of multiple high level interference sources. Because of economic considerations due to the length of line it may be more feasible to limit the extent of repair work to more populated areas of the line.

The section of line along County Road #9 from Hwy #28 to Burnham Street would be a good section to start remedial work, as it is the most populated and where the majority of TV interference complaints have originated. This section also includes the line past the main complainant Mrs. Benson. Noise level chart recordings indicated two very high level interference distribution poles directly south of her. Her antenna direction when receiving the TV stations to the south looks directly through these poles.

The last few kms of line down by Bomanton DS are very sparcely populated and although excessively noisy it would not be economical to work on this section at this time. Although noise can propagate down the line, this distance I feel is too great to consider a problem. If a problem is experienced it can be repaired at a future date.

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* Noise levels were measured on a peak detector at 70 MHz in a 1 MHz bandwidth and are in dB referred to 1 μV at the meter input. To obtain the field intensity of the noise at the antenna in dB above 1 μV/m, add the biconical antenna correction factor which is 6 dB at 70 MHz.

The line survey determined that the primary cause of interference sources is loose hardware (gap-type). Crossarm braces are known to be a major source of high amplitude gap noise. All hardware should be tightened and if the crossarm braces are secured by lag bolts they should be changed to through bolts with lock nuts.

Although insulators are a secondary noise source with lower amplitudes than large gap-noise it is recommended that if an insulator change is done the pin insulators should be replaced by post type. This reduces most insulator interference but also reduces the leakage current through the insulator that may cause small gap sources from loose insulator pins, nuts, or washers.

EMI sources are hard to eliminate indefinitely on woodpole crossarmed lines experiencing strong winds and galloping. The new armless improved appearance line design greatly reduces interference sources in the short term and over the long term.

Approved:

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Submitted:

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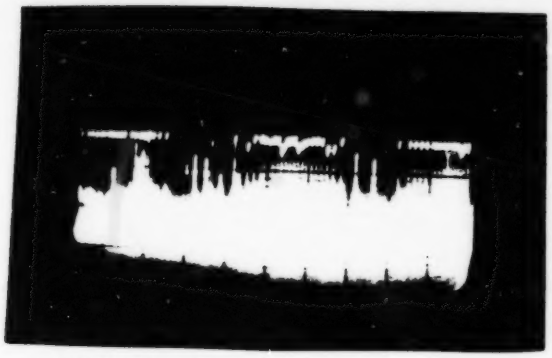
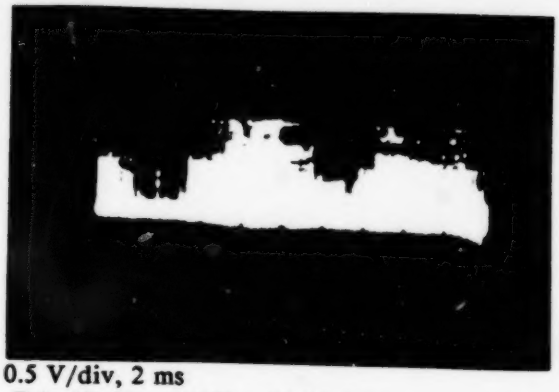
DRG:td

EXAMPLES OF OSCILLOSCOPE PICTURES
COBOURG INTERFERENCE SOURCES

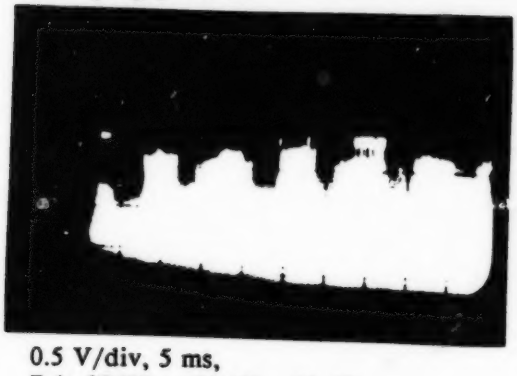
(Along County Road #9 Line 50M5 - September 8-10, 1986)



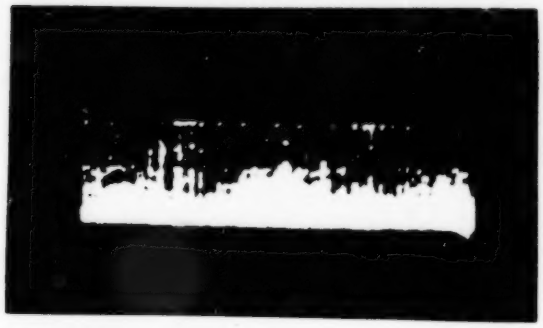
0.5 V/div, 2 ms,
Rdg 37/57 → 45dB + 20 Attn
- single gap source



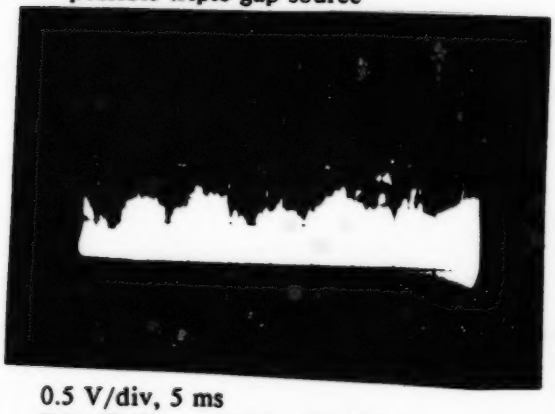
0.5 V/div, 2 ms
Rdg 37/57 → 45dB + 20 dB Attn
- double gap source



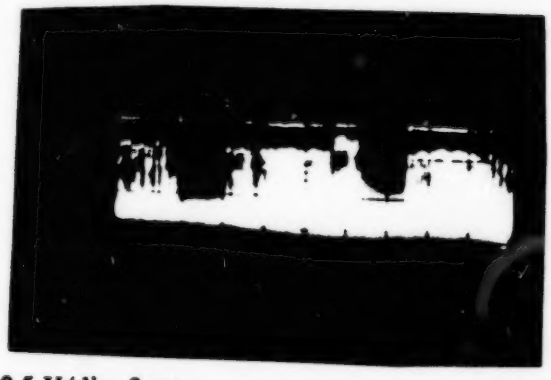
0.5 V/div, 5 ms,
Rdg 37/57 → 40 dB + 20 dB
- possible triple gap source



0.5 V/div, 2 ms
Rdg 37/57 → 50 dB + 20 dB Attn
- double gap source



0.5 V/div, 5 ms
Rdg 37/57 → 45 dB + 20 dB Attn
- double gap source



0.5 V/div, 2 ms
Rdg 37/57 → 50 dB + 20 dB Attn
- single gap source